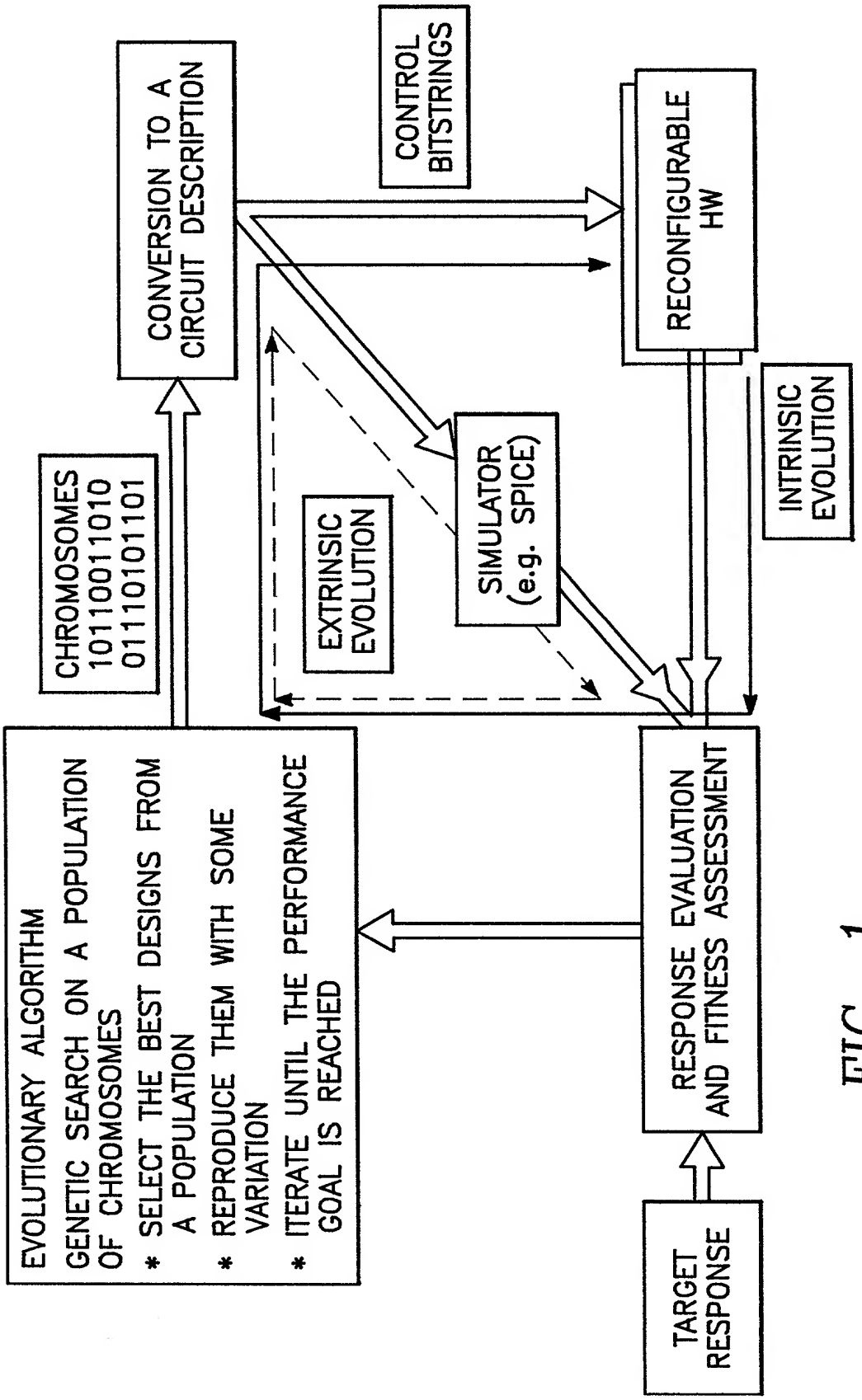

EVOLUTIONARY ALGORITHM
GENETIC SEARCH ON A POPULATION OF CHROMOSOMES
* SELECT THE BEST DESIGNS FROM A POPULATION
* REPRODUCE THEM WITH SOME VARIATION
* ITERATE UNTIL THE PERFORMANCE GOAL IS REACHED
CHROMOSOMES
10110011010
01110101101
CONVERSION TO A CIRCUIT DESCRIPTION
CONTROL BITSTRINGS
RECONFIGURABLE HW
SIMULATOR (e.g. SPICE)
EXTRINSIC EVOLUTION
INTRINSIC EVOLUTION
RESPONSE EVALUATION AND FITNESS ASSESSMENT
TARGET RESPONSE

FIG. 1

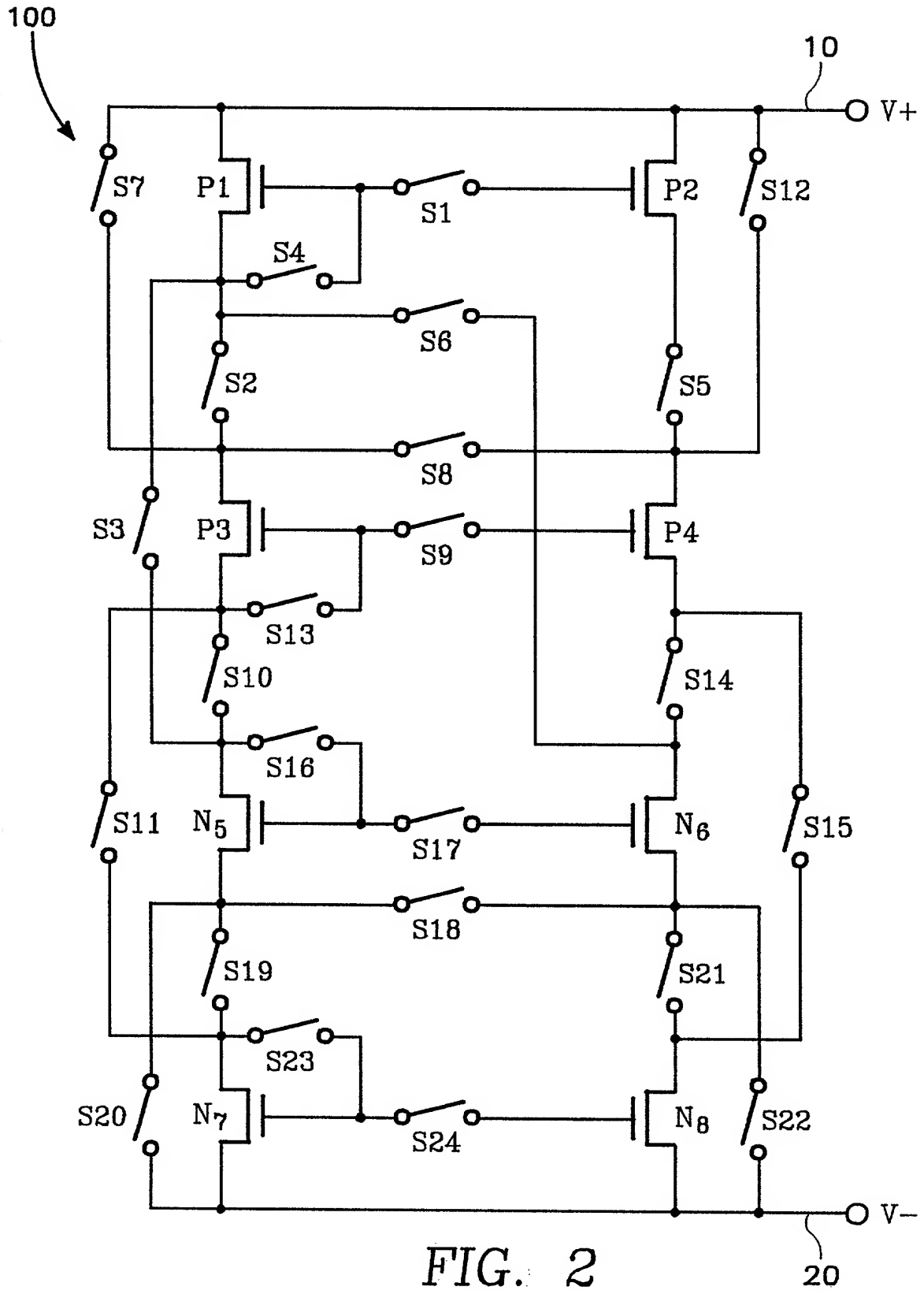


FIG. 2

20020170 - 5311 5077

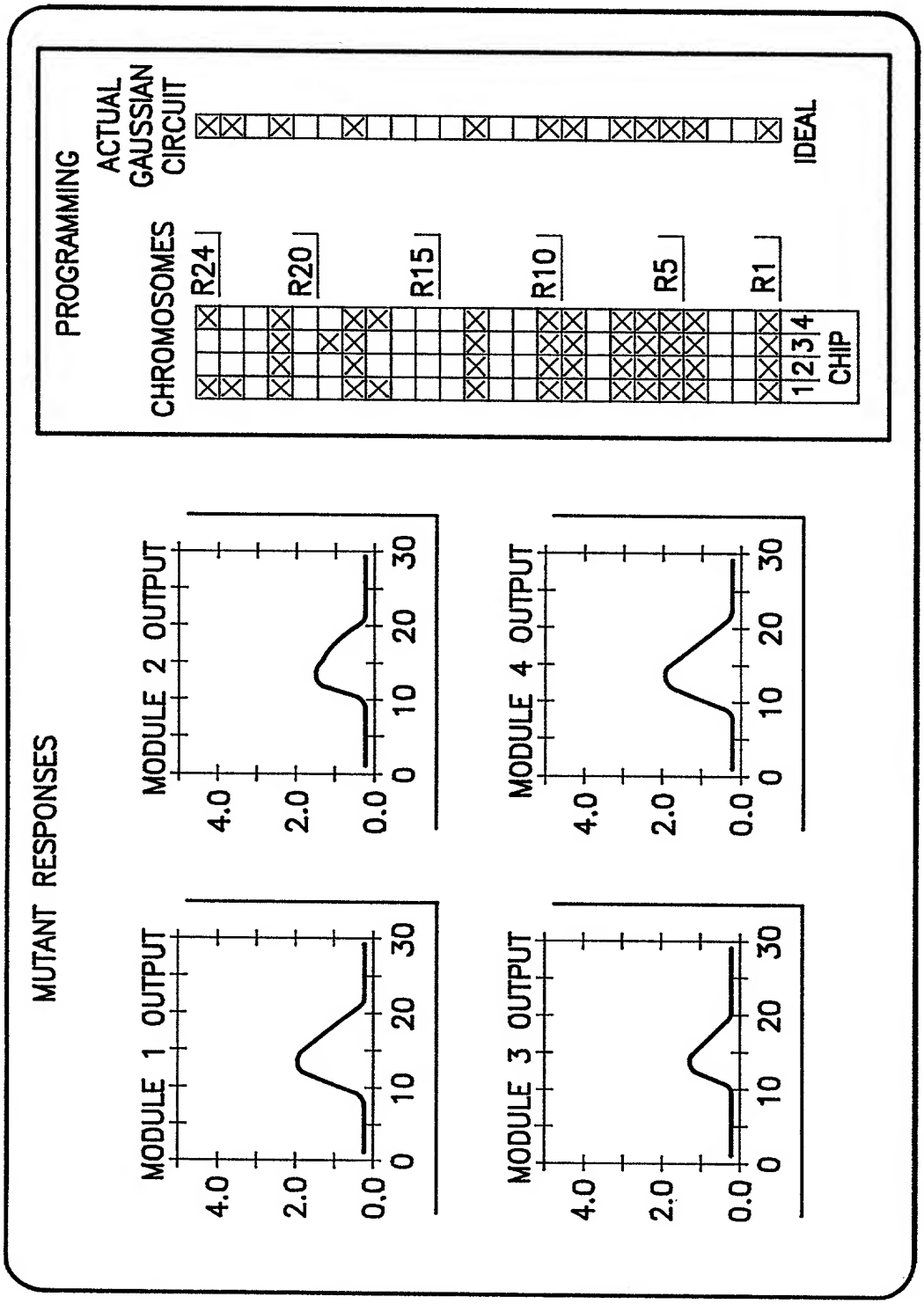

PROGRAMMING
ACTUAL GAUSSIAN CIRCUIT
IDEAL
CHROMOSOMES
R24
R20
R15
R10
R5
R1
1|2|3|4
CHIP
MUTANT RESPONSES
MODULE 1 OUTPUT
MODULE 2 OUTPUT
MODULE 3 OUTPUT
MODULE 4 OUTPUT
4.0
2.0
0.0
0
10
20
30

FIG. 3

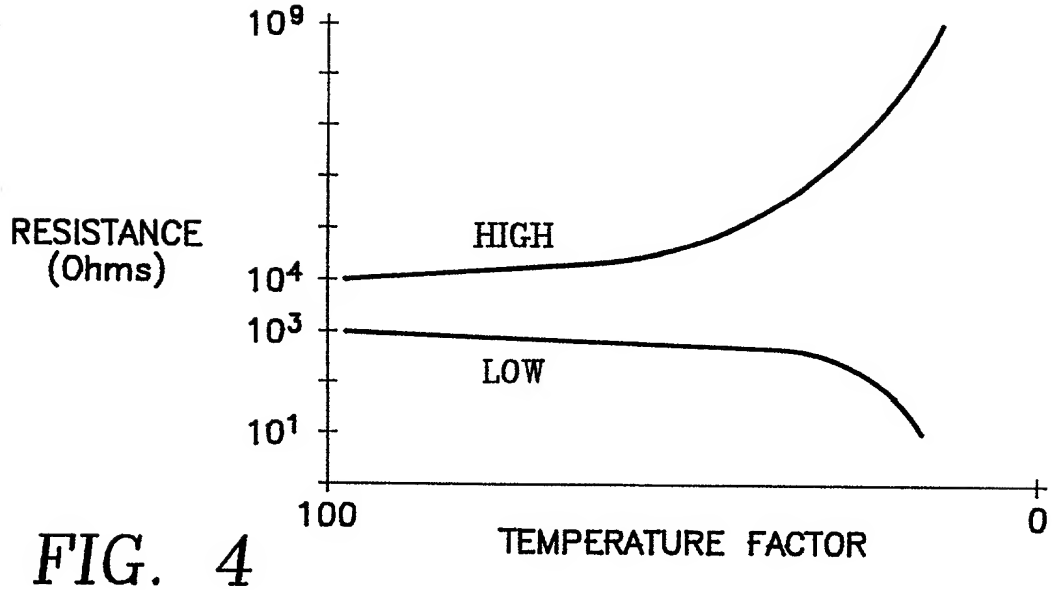


FIG. 4

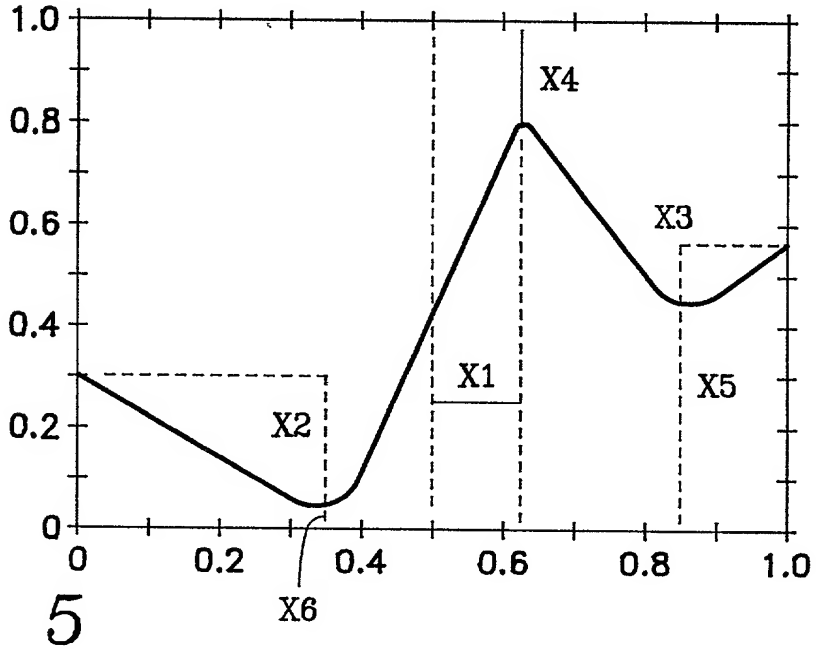
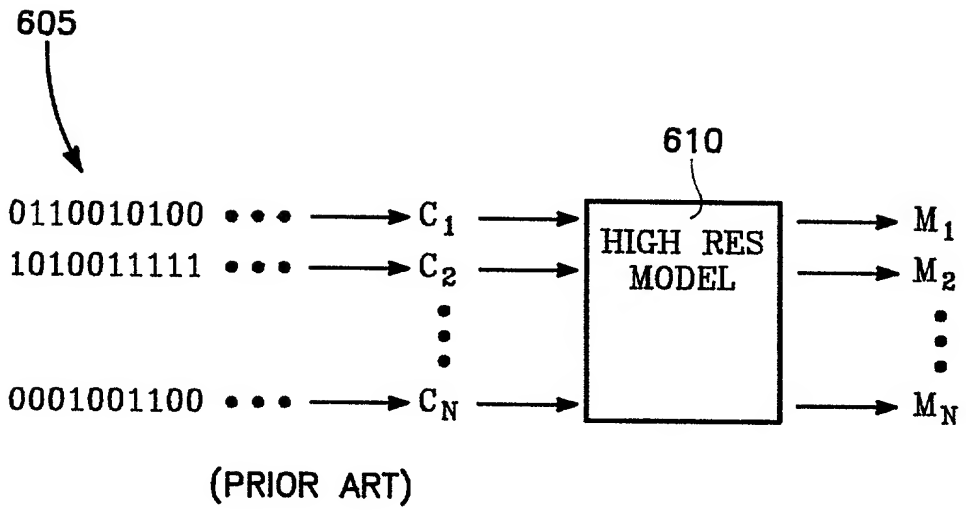


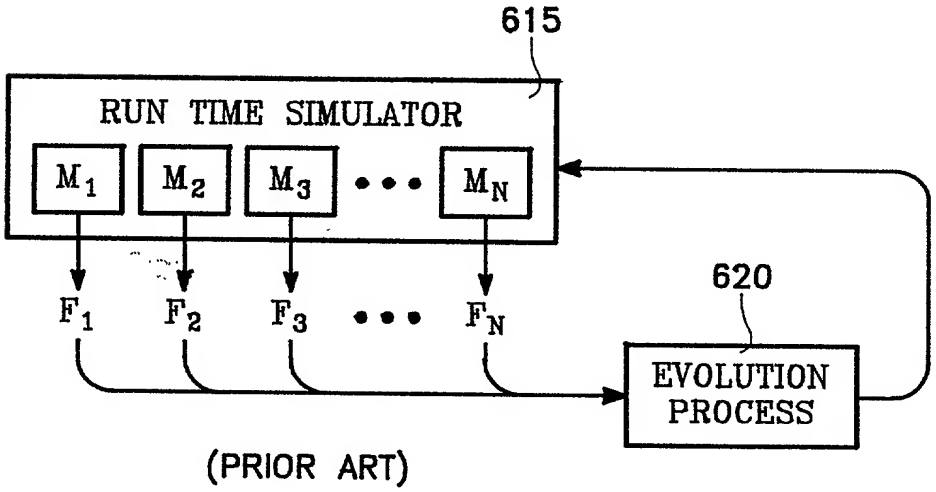
FIG. 5

Edgefield Software



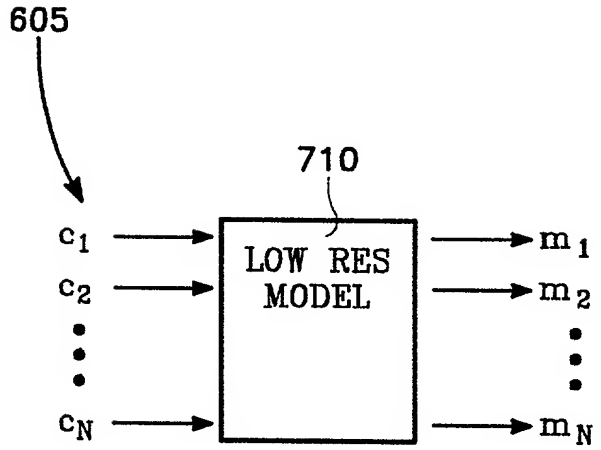
(PRIOR ART)

FIG. 6A



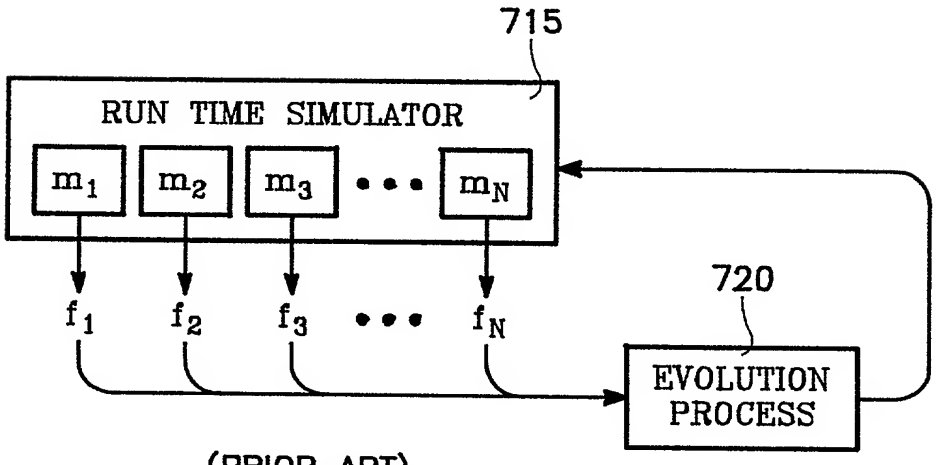
(PRIOR ART)

FIG. 6B



(PRIOR ART)

FIG. 7A



(PRIOR ART)

FIG. 7B

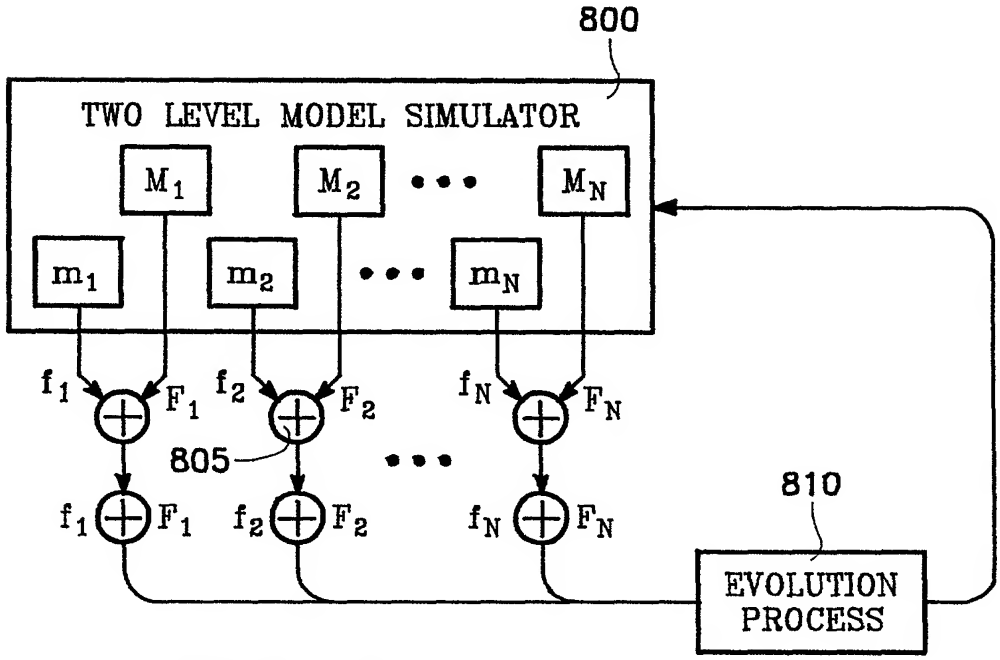

800
TWO LEVEL MODEL SIMULATOR
M1
M2
MN
m1
m2
mN
f1
F1
f2
F2
fN
FN
805
810
EVOLUTION PROCESS

FIG. 8

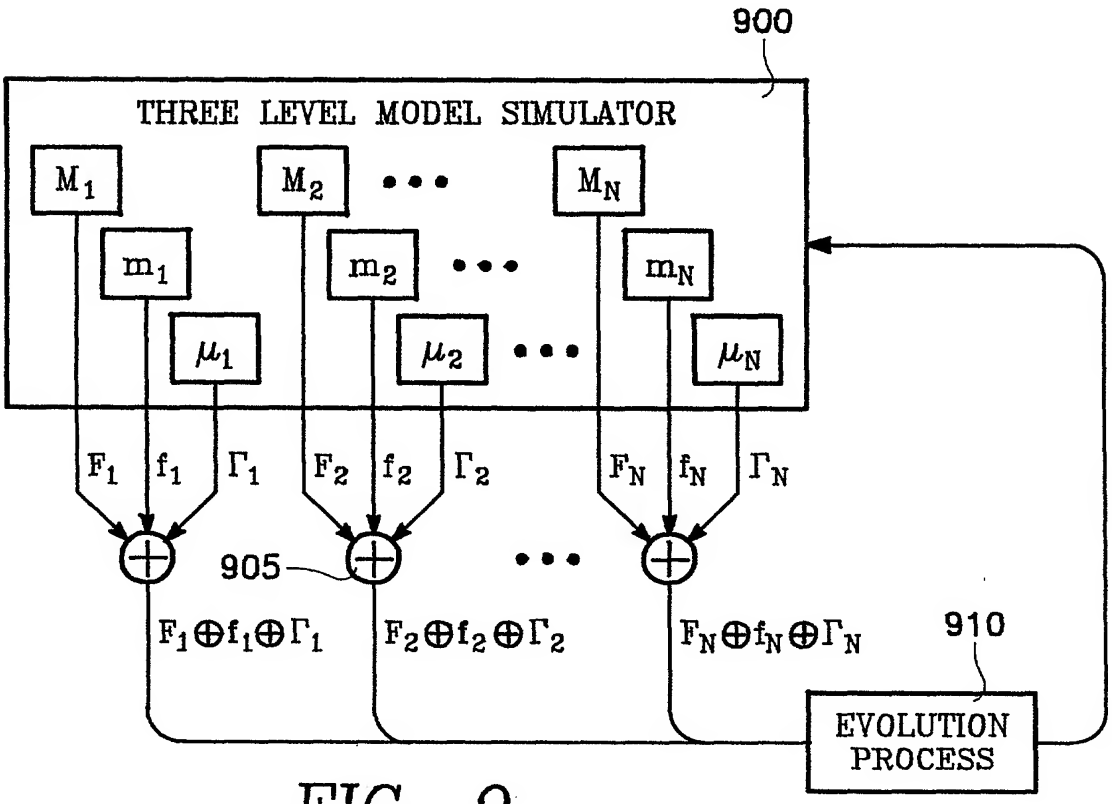

900
THREE LEVEL MODEL SIMULATOR
M1
M2
MN
m1
m2
mN
μ1
μ2
μN
F1
f1
Γ1
F2
f2
Γ2
FN
fN
ΓN
905
F1⊕f1⊕Γ1
F2⊕f2⊕Γ2
FN⊕fN⊕ΓN
910
EVOLUTION PROCESS

FIG. 9

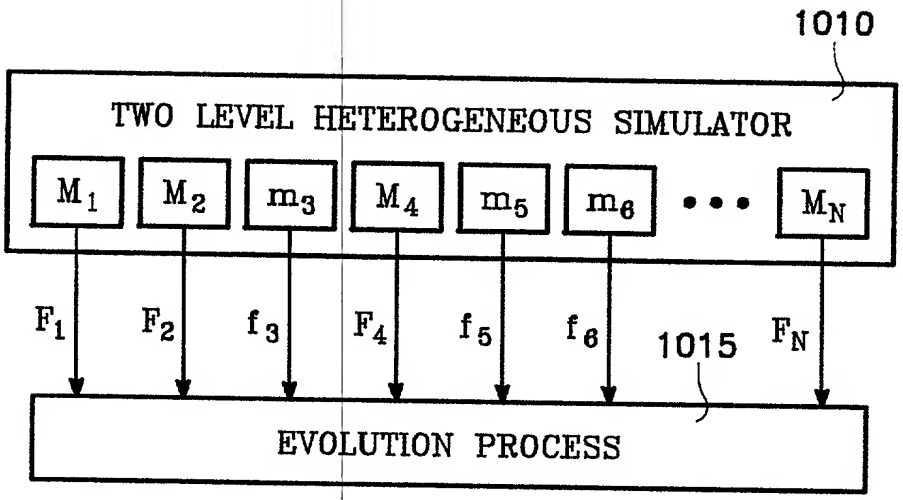

1010
TWO LEVEL HETEROGENEOUS SIMULATOR
M1 M2 m3 M4 m5 m6 ... MN
F1 F2 f3 F4 f5 f6 1015 FN
EVOLUTION PROCESS

FIG. 10

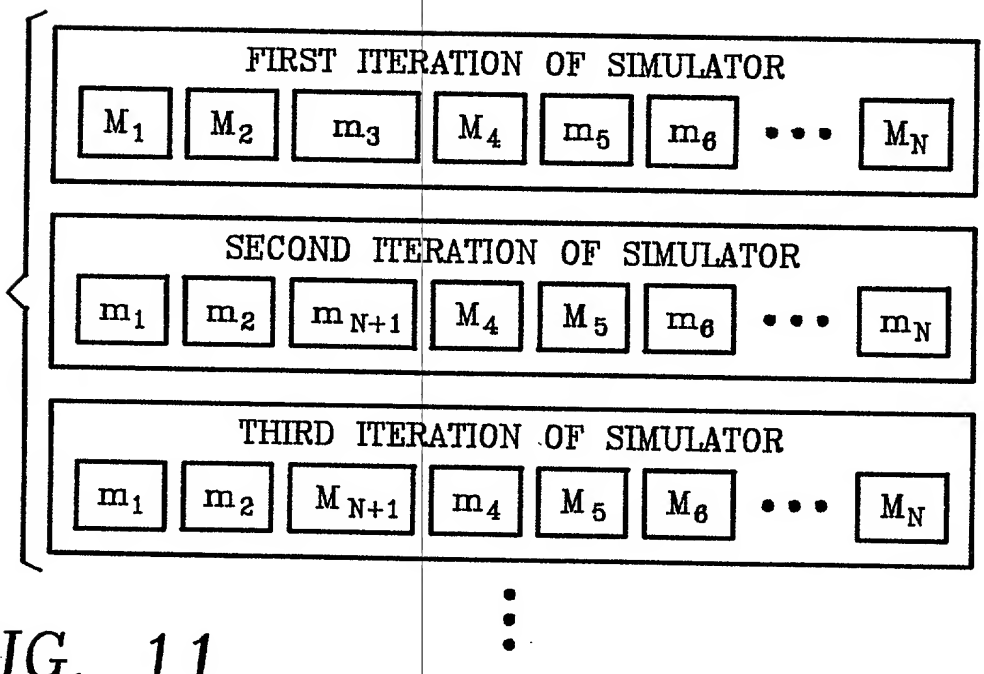

FIRST ITERATION OF SIMULATOR
M1 M2 m3 M4 m5 m6 ... MN
SECOND ITERATION OF SIMULATOR
m1 m2 mN+1 M4 M5 m6 ... mN
THIRD ITERATION OF SIMULATOR
m1 m2 MN+1 m4 M5 M6 ... MN

FIG. 11

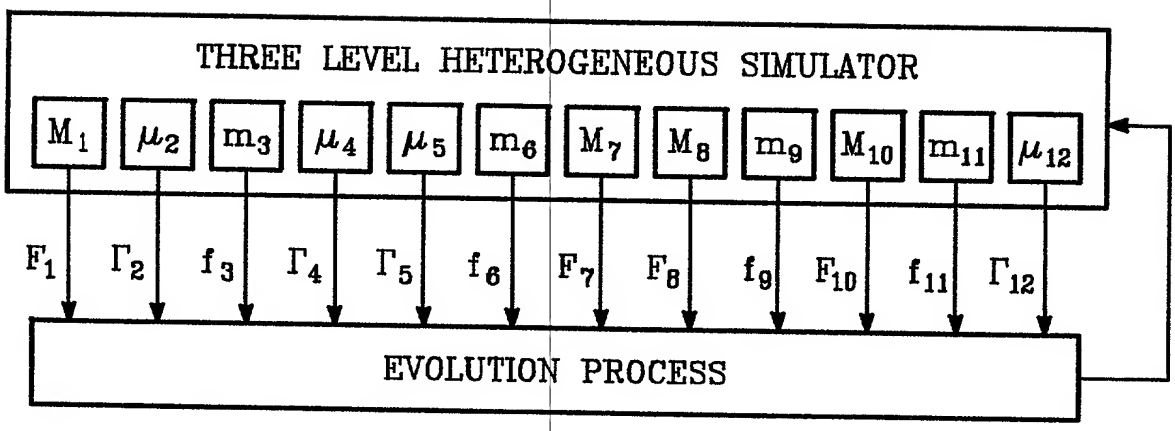

THREE LEVEL HETEROGENEOUS SIMULATOR
M1 μ2 m3 μ4 μ5 m6 M7 M8 m9 M10 m11 μ12
F1 Γ2 f3 Γ4 Γ5 f6 F7 F8 f9 F10 f11 Γ12
EVOLUTION PROCESS

FIG. 12

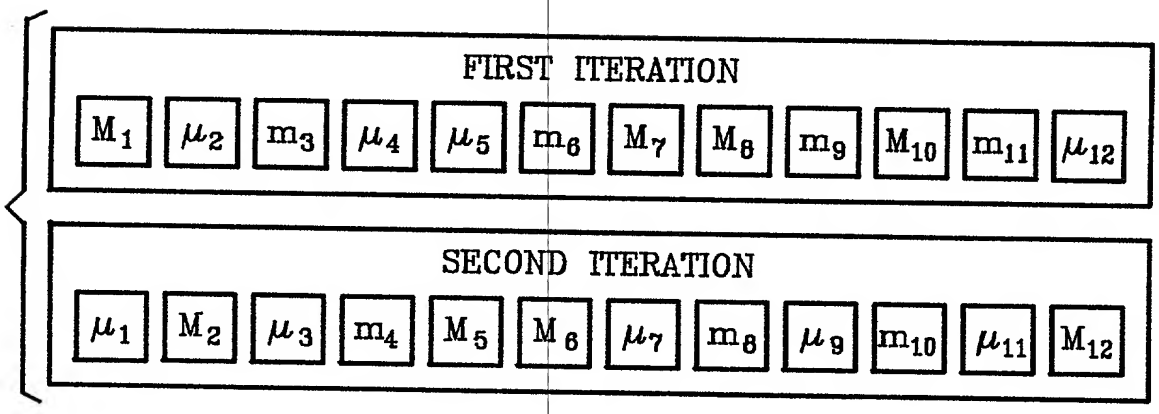

FIRST ITERATION
M1 μ2 m3 μ4 μ5 m6 M7 M8 m9 M10 m11 μ12
SECOND ITERATION
μ1 M2 μ3 m4 M5 M6 μ7 m8 μ9 m10 μ11 M12

FIG. 13

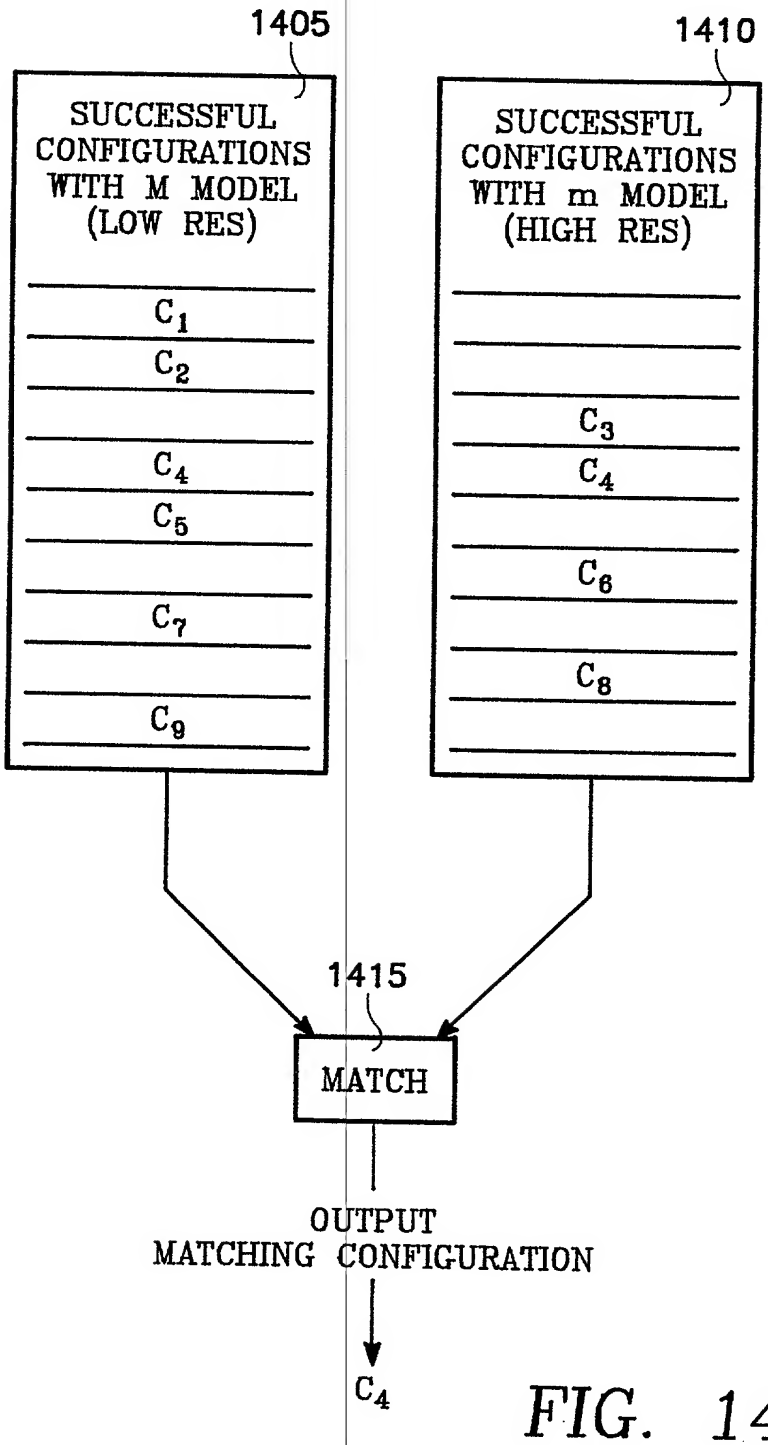

1405
SUCCESSFUL CONFIGURATIONS WITH M MODEL (LOW RES)
C1
C2
C4
C5
C7
C9
1410
SUCCESSFUL CONFIGURATIONS WITH m MODEL (HIGH RES)
C3
C4
C6
C8
1415
MATCH
OUTPUT MATCHING CONFIGURATION
C4

FIG. 14

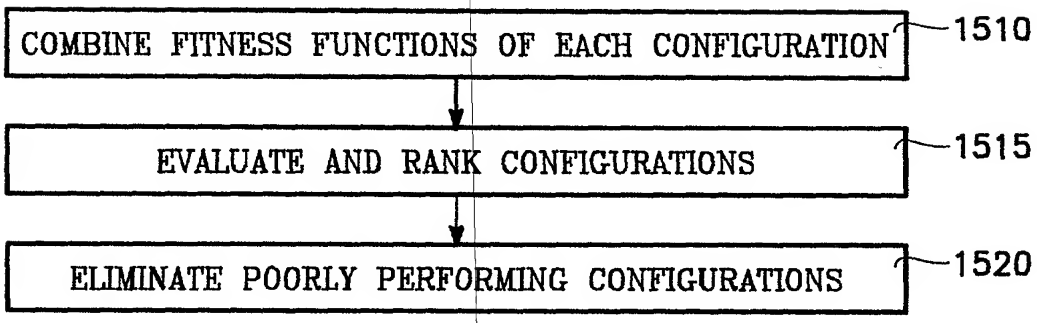


FIG. 15

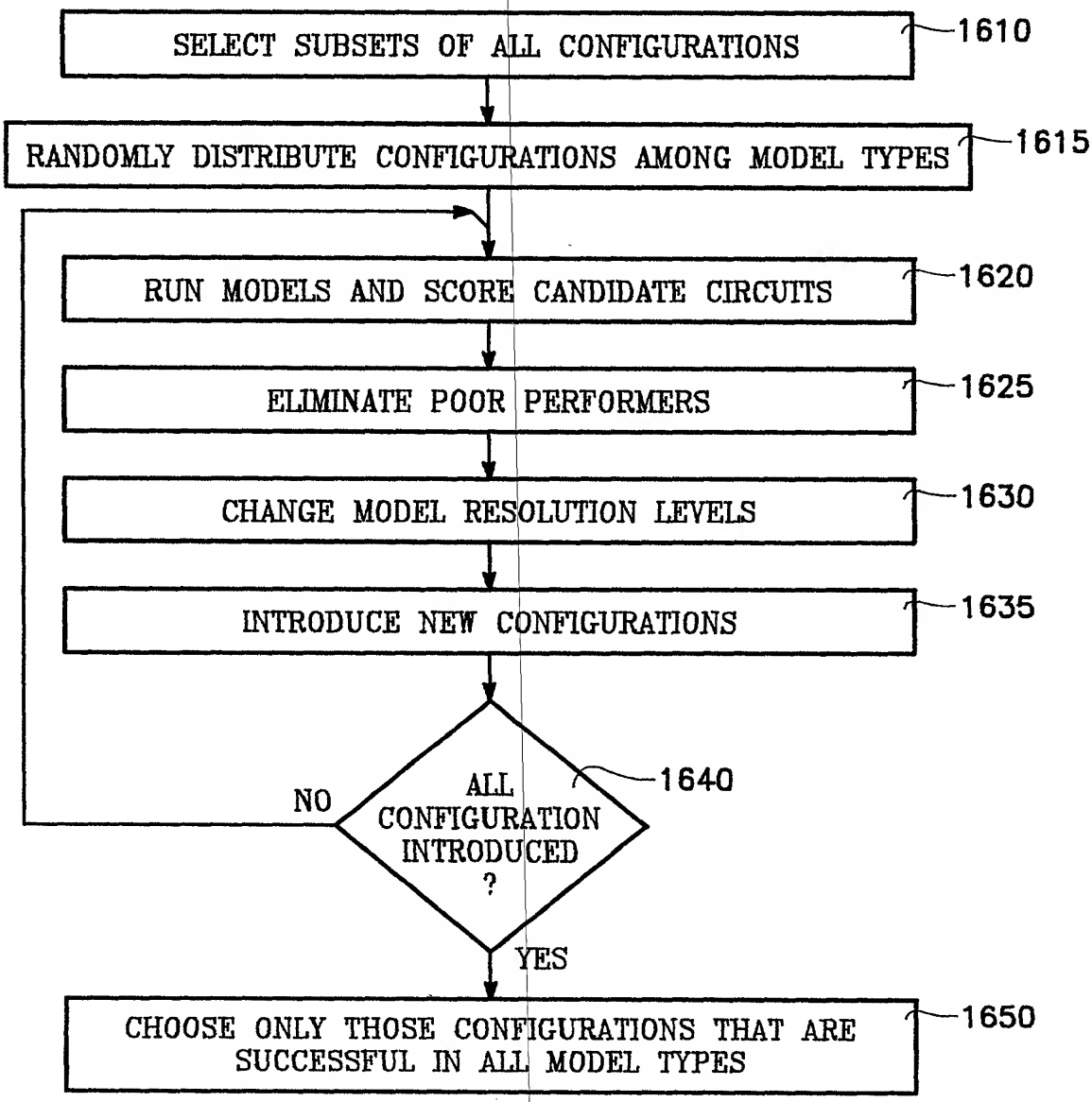


FIG. 16

4,935,877 - 05 Jun 90